Low-Cost Mixed-Phase Cloud Characterization Sensor Suite, Phase I

Completed Technology Project (2018 - 2019)

Project Introduction

Radiative transfer properties of clouds play an important role in the energy balance of the Earth. Numerous NASA programs and experiments are directed to measuring these effects. In-situ measurements are critical for supporting satellite-borne instruments. While research aircraft carry the best in-situ instruments, the aircraft and instruments are too expensive to provide sufficient coverage. Anasphere is developing a suite of low-cost, balloon-borne instruments that can quantify all three condensed phases of water in clouds: supercooled liquid, liquid, and ice. The first two instruments have been developed and are used around the world. This project is directed to developing the ice water content (IWC) sensor to complete the trio. Addition of an IWC sensor will yield a suite of instruments that can be used for measurements of all cloud types including mixed-phase clouds.

In Phase I, an IWC sensor which is a derivative of the preceding successful instruments will be developed. This will entail the development of a suitable ice collection medium and associated calibration equations. Supporting work to be completed will include optimizing Anasphere's icing wind tunnel for pure ice particle conditions. Phase I will conclude with the new IWC sensor being operated in the icing wind tunnel.

Anticipated Benefits

The primary NASA applications are found in two programs: the Earth Observing System through CERES (Clouds and the Earth's Radiant Energy System experiment), and the Radiation Sciences Program through FIRE (First International Satellite Cloud Climatology Project Regional Experiment). The instruments, by virtue of being inexpensive balloon-borne payloads, will enable greater spatial and temporal coverage in support of validation and verification efforts related to these experiments.

Other agencies (especially the Department of Energy) are engaged in radiative transfer research and will be key beneficiaries of this technology. Numerous other agencies and institutions are engaged in various forms of cloud research and could apply this sensor as well.

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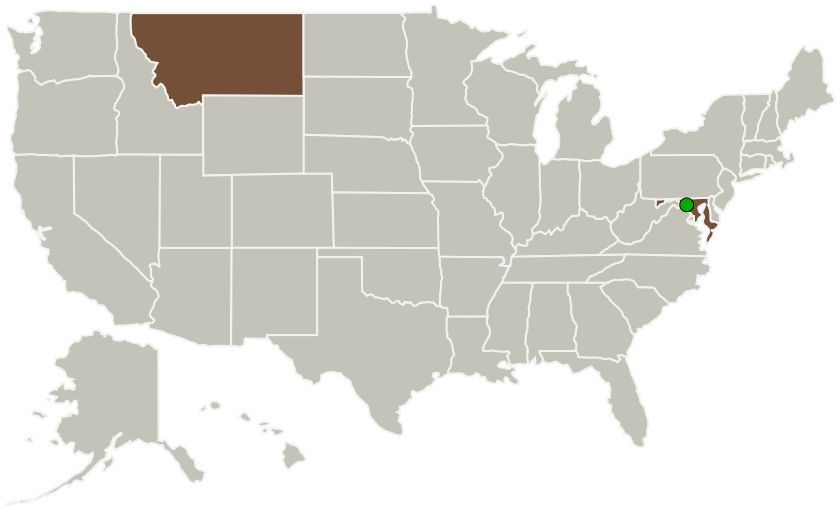
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Anasphere, Inc.	Lead Organization	Industry	Belgrade, Montana
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Montana

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141161)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Anasphere, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

John A Bognar

Co-Investigator:

John Bognar

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Images

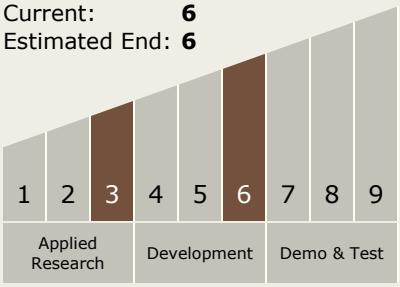
Briefing Chart Image
Low-Cost Mixed-Phase Cloud Characterization Sensor Suite, Phase I
(https://techport.nasa.gov/image/127576)

Final Summary Chart Image
Low-Cost Mixed-Phase Cloud Characterization Sensor Suite, Phase I
(https://techport.nasa.gov/image/133661)

Final Summary Chart Image
Low-Cost Mixed-Phase Cloud Characterization Sensor Suite, Phase I
(https://techport.nasa.gov/image/134379)

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destination

Earth